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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MITSUAKI HIROKWA, MASAAKI ANDO,
SHINICHI CHIKURA and SATORU ISHIHARA

Appeal 2009-005444
Application 10/806,416
Technology Center 1700

Decided: September 10, 2009

Before JAMES T. MOORE, *Vice-Chief Administrative Patent Judge*,
TERRY J. OWENS, and PETER F. KRATZ *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL
STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-5, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a spiral separation membrane element. The Appellants state that the membrane element is “effective in membrane separation conducted at low pressure, such as ultralow-pressure reverse osmosis filtration, ultrafiltration, or microfiltration” (Spec. 1). Claim 1 is illustrative:

1. A spiral separation membrane element comprising:
 - a perforated cored tube formed with a plurality of perforations;
 - a separation membrane;
 - a feed-side passage material;
 - a first permeation-side passage material; and
 - a second permeation-side passage material being spirally wound around the perforated cored tube, wherein
 - the separation membrane, the feed-side passage material, and the first permeation-side passage material are spirally wound around the second permeation-side passage material;
 - the feed-side passage material and the first permeation-side passage material are disposed respectively on the feed side and permeation side of the separation membrane; and
 - the effective perforated-part area as calculated by multiplying the total area of the perforations in the perforated cored tube by the percentage of openings in one layer of the second permeation-side passage material is at least 1.0 time the inner cross-sectional area of the core tube.

The References

Schmidt	6,352,641 B1	Mar. 5, 2002
De la Cruz (WO '528)	WO 02/051528 A1	Jul. 4, 2002
Haq	6,702,941 B1	Mar. 9, 2004

The Rejections

Claims 1-5 stand rejected under 35 U.S.C. § 103 over WO ‘528 and/or Schmidt, and Haq.¹

OPINION

We affirm the Examiner’s rejection.

Issue

Have the Appellants shown reversible error in the Examiner’s determination that the applied references would have rendered *prima facie* obvious, to one of ordinary skill in the art, an effective perforated-part area, as calculated by multiplying the total area of the perforations in a perforated core tube by the percentage of openings in one layer of a second permeation-side passage material spirally wound around the core tube, which is at least 1.0 time the inner cross-sectional area of the core tube?

Findings of Fact

The Examiner relies upon Schmidt’s figures and column 1, lines 8-38, and WO ‘528’s Example 5 as disclosing each element of the claimed invention except for the effective perforated part area (Ans. 4-6). The Examiner finds that Haq discloses in column 26, lines 34-55 and Figure 4 that the perforation area of the disclosed filter element should be at least

¹ Haq was not, but should have been, included in the Examiner’s statement of the rejection. *See In re Hoch*, 428 F.2d 1341, 1342 n.3 (CCPA 1970). We consider Haq as properly included in the rejection because that reference has been expressly relied upon by the Examiner in the body of the rejection set forth in the Final Office Action (FOA) and the Examiner’s Answer, and, without objection, has been considered and addressed by the Appellants in their Brief (FOA, 4; Ans. 6-8; Br. 10-11).

equal to the area of the filter end face so that the perforations do not create flow restriction (Ans. 6-7).

Analysis

The Appellants acknowledge the following regarding the prior art spiral separation membranes (Spec. 1-2):

In designing such a spiral separation membrane element, the inner diameter of the core tube has been determined first according to the rate of flow of the permeated liquid through the core tube serving as a water-collecting tube, because the pressure loss for the flow in the tube is governed by the relationship between the flow rate or the like in the tube and the inner diameter of the tube. Subsequently, the total area of perforated parts in the perforated core tube is determined. However, it has been thought that the appropriate range of the total perforated-part area is about 2-4 times the cross-sectional area of the core tube while taking account of the inner diameter of the core tube, the size of the perforations, etc.

However, in the structure in which a permeation-side passage material is wound around perforated parts, the substantial area of the perforated parts has been far smaller than [sic] the supposed area because the percentage of openings of one layer of the permeation-side passage material is as low as about 20%. Namely, even when only one layer of a permeation-side passage material has been wound around the core tube, the substantial area of perforated parts is less than one time the inner cross-sectional area of the core tube and this has constituted resistance on the permeation side.

That is, when the prior art total perforated-part area of 2-4 times the inner cross-sectional area of the core tube is multiplied by the 20% open area of one layer of the permeation-side passage material, the product is 0.4 (0.2 x 2) to 0.8 (0.2 x 4). Because that product is less than 1, i.e., the effective perforated-part area is less than the core tube inner cross-sectional area, the flow into the core tube is restricted relative to the possible flow through the

core tube, thereby resulting in a pressure loss. The Appellants' solution to that pressure loss problem is to make the effective perforated-part area for flow into the tube equal to or greater than the inner cross-sectional area of the core tube. The Appellants use a permeation-side passage material having preferably 30-40% open area instead of the prior art 20% open area (Spec. 8). Thus, when the permeation-side passage material open area is multiplied by, for example, the prior art 2-4 ratio of total tube perforation area to core tube inner cross-sectional area, the product is 0.6 (0.3 x 2) to 1.6 (0.4 x 4). Combinations of core tube total perforation area/inner cross-sectional area ratio and permeation-side passage material open area that result in a product which is at least 1.0 are within the scope of the Appellants' claimed membrane element.

The Appellants argue that Schmidt, WO '528 and Haq do not disclose or suggest that the effective perforated-part area is a result effective variable (Br. 11).

The Appellants disclose, regarding the prior art, that "even when only one layer of a permeation-side passage material has been wound around the core tube, the substantial area of perforated parts is less than one time the inner cross-sectional area of the core tube and this has constituted resistance on the permeation side" (Spec. 2). That disclosure indicates that it was known in the art that the effective perforated-part area is a result effective variable, i.e., if the effective perforated-part area is too small relative to the core tube inner cross-sectional area, there will be resistance on the permeation side resulting in a pressure drop between the outside and the inside of the core tube. One of ordinary skill in the art who was aware of that resistance problem would have used any of the finite number of

predictable solutions to solve the problem, such as making the effective perforated-part area larger by increasing the core tube perforation area and/or the permeation-side passage material open area. *See KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense”).

The Appellants argue that the applied references do not disclose or suggest making the product of the core tube perforation area and the open area of one layer of the second permeation-side passage material equal to or greater than the inner cross-sectional area of the core tube (Br. 9-11).

One of ordinary skill in the art, through no more than ordinary creativity, would have made the effective perforated-part area at least as large as the core tube inner cross-sectional area to avoid the above-discussed pressure loss between the outside and inside of the core tube that would occur if the effective perforated-part area were less than the core tube inner cross-sectional area. *See KSR*, 550 U.S. at 418 (In making an obviousness determination one “can take account of the inferences and creative steps that a person of ordinary skill in the art would employ”).

Conclusion of Law

The Appellants have not shown reversible error in the Examiner’s determination that the applied references would have rendered *prima facie* obvious, to one of ordinary skill in the art, an effective perforated-part area, as calculated by multiplying the total area of the perforations in a perforated

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core tube by the percentage of openings in one layer of a second permeation-side passage material spirally wound around the core tube, which is at least 1.0 time the inner cross-sectional area of the core tube.

DECISION/ORDER

The rejection of claims 1-5 under 35 U.S.C. § 103 over WO '528 and/or Schmidt is affirmed.

It is ordered that the Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

tc

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